REMARKS

Claims 1 and 5-6 are currently pending in this application.

Claim 2 has been canceled.

Claims 1 and 5 have been amended.

Applicants have amended claim 1 to clarify that the particles of high density cobalt-manganese coprecipitated nickel hydroxide with a tapping density of 1.5 g/cc or greater according to the present invention are spherical particles that are **free of non-spherical particles** and have a **mean particle size in the range of 5-20 μm**.

What is claimed is:

"Claim 1. Spherical particles of high density cobalt-manganese coprecipitated nickel hydroxide that are free of non-spherical particles of the same, wherein said cobalt-manganese coprecipitated nickel hydroxide is represented by the formula:

$$(Ni_{(1-x-y)}Co_xMn_y)(OH)_2$$

wherein $1/10 \leq x \leq 1/3$ and $1/20 \leq y \leq 1/3$; and

wherein said particles have a tapping density of 1.5 g/cc or greater and a mean particle size in the range of 5-20 μm."

Claim 5 has been amended to reflect the amendments to claim 1.

Claims 5 has been amended to define that the spherical particles according to the present invention are prepared by a unique process as defined in claims 5-6, which produces novel spherical particles of high density cobalt-manganese coprecipitated nickel hydroxide with a tapping density of 1.5 g/cc or greater, which are **free of non-spherical particles** and have a **mean particle size in the range of 5-20 μm**.

The novel particles produced by the process defined in claims 5-6 are **spherical.** Further, the particles according to claims 5-6 of the present invention **do not contain non-spherical particles** (see Fig. 1).

This unique property has neither been taught nor suggested by the prior art and is the result of the fact that the claimed particles are formed by a novel process which provides total control over the shape of the particles as they coprecipitate from the reaction mixture.

Support for the amendments to claims 1 and 5 is found on page 3, line 24 to page 4, line 3, in the section entitled "DETAILED DESCRIPTION OF THE INVENTION," where the specification states:

> "The cobalt-manganese coprecipitated nickel hydroxide of the invention is characterized by having high density, and specifically, a density of 1.5 g/cc or

greater. The specific surface area of the cobalt-manganese coprecipitated nickel hydroxide of the invention is in the range of 8-20 m^2/g, and as shown in FIG. 1 it is spherical with a mean particle size in the range of 5-20 μm."

Further support is found on page 6, line 22 to page 7, line 7, and elsewhere in the specification, where the process details are described in detail.

Claims 1 and 5-6 are rejected under 35 U.S.C. § 102(b), as being anticipated by Ikoma et al. (U.S. Patent No. 5,700,596).

Applicants have amended claims 1 and 5 to define that the high density cobalt-manganese coprecipitated nickel hydroxide spherical particles according to the present invention are **free of non-spherical particles** of the same, and that these particles have a **mean particle size in the range of 5-20 μm**."

The particles of high density cobalt-manganese coprecipitated nickel hydroxide according to the present invention are **spherical**. They **do not contain non-spherical particles** because they are manufactured by a novel process which provides total control of the shape of the particles as they coprecipitate from the reaction mixture.

Thus, on page 3, line 24 to page 4, line 3, in the section entitled "DETAILED DESCRIPTION OF THE INVENTION," the specification states:

"The cobalt-manganese coprecipitated nickel hydroxide of the invention is

characterized by having high density, and specifically, a density of 1.5 g/cc or greater. The specific surface area of the cobalt-manganese coprecipitated nickel hydroxide of the invention is in the range of 8-20 m^2/g, and as shown in FIG. 1 it is spherical with a mean particle size in the range of 5-20 μm."

On page 6, line 22 to page 7, line 7, the specification further states:

With pH control alone, decomposition and evaporation of ammonia alters the ammonium ion concentration in the solution, such that generation of crystal nuclei produced from the ammonium complex salt becomes unstable. Only by controlling the ammonium ion concentration of the solution does generation of crystal nuclei become constant, so that uniform growth of particles occurs. In order to maintain such a mechanism, the ammonium ion source and alkali metal hydroxide must consistently match the necessary amount of metal ion, and therefore the reaction process is preferably carried out in a continuous manner. By speeding up the stirring rate, an abrading effect also occurs between the particles, and this repeated abrasion and growth result in fluidized, spherical high density particles.

Referring to FIG. 1, it can be seen that the particles according to the present invention are **spherical.** It can also be seen from Fig. 1 that the particles according to the present invention **do not contain non-spherical particles.**

This unique property is the result of the fact that the claimed particles are manufactured by the novel process of the present invention which provides total control over the shape of the particles as they coprecipitate from the reaction mixture.

Further, in the ABSTRACT of U.S. Patent No. 5,700,596, Ikoma et al. states:

"ABSTRACT

The tap density of nickel hydroxide powders is improved, the expansion of a positive electrode is inhibited and the energy density of the positive electrode and the cycle life characteristics are improved by specifying the shape of the nickel hydroxide powders and besides, adding to the nickel hydroxide powders at least one of Cd, Ca, Zn, Mg, Fe, Co and Mn. The nickel hydroxide active material powders contain 1-7 wt % of at least one of Cd, Ca, Zn, Mg, Fe, Co and Mn and comprise a mixture of spherical or nearly spherical particles and non-spherical particles."

Thus, the nickel hydroxide powders of Ikoma et al. "comprise a mixture of spherical or nearly spherical particles and non-spherical particles."

This characterization of the powders as being a **mixture of spherical and non-spherical particles** is mentioned repeatedly in:

(1) claims 1, 11, 16 and 31;

(2) in the three paragraphs extending from Column 2, line 66 to Column 3, line 61; and

(3) in FIG. 1.

Further, the paragraph in Column 5, line 54 to Column 6, line 10, of U.S. Patent No. 5,700,596, Ikoma et al. states:

"The packing density was measured in the following manner: Respective

> nickel hydroxide powders were packed in a sponge-like nickel porous body having a porosity of 95% and a basis weight of 350 g/m^2, this was pressed under a given pressing condition and cut to a given length, and the thickness was measured and the packing density was calculated. The tap density and packing density of nickel hydroxide of the present invention and the comparative example are shown in Table 1. As is clear from the comparison on the tap density and packing density shown in Table 1, the nickel hydroxide powders of the present invention are higher in tap density and superior in packing density as compared with those of the comparative example. This is because since the nickel hydroxide powders of the comparative example were in the square form and many voids were present between the particles as compared with spherical particles, tap density and packing density were not improved. On the other hand, since the nickel hydroxide powders of the present invention comprised a mixture of spherical particles and non-spherical particles, the non-spherical particles were packed in the voids between the spherical particles. As a result, the nickel hydroxide powders showed excellent characteristics of 2.01 g/cc in tap density and 630 mAh/cc in packing density."

Clearly, the powder described by Ikoma et al. is a **mixture of spherical and non-spherical particles** and, as such, is different from the instantly claimed particles of high density cobalt-manganese coprecipitated nickel hydroxide, which are **spherical**.

Further, the particles according to the present invention **do not contain non-spherical particles** because they are manufactured by a novel process, which provides total control of the shape of the particles as they coprecipitate from the reaction mixture.

In contrast to the instantly claimed spherical particles, the particles described by Ikoma et al. are **a mixture of spherical and non-spherical particles, each having a different range of particle size**.

Thus, claim 1 of Ikoma et al. States:

"1. A nickel hydroxide active material powder for use in making nickel positive electrodes, which is a mixture of spherical or nearly spherical particles having a particle size of about 10-30 μm and non-spherical particles having a particle size of less than about 10 μm which comprises a nickel hydroxide powder containing 1-7 wt % of at least one metal selected from the group consisting of cadmium, calcium, zinc, magnesium, iron, cobalt and manganese before production of positive electrodes and is an aggregate of innumerable primary particles of 0.1 μm or less."

Clearly, the material described by Ikoma et al. is:

"**a mixture of spherical or nearly spherical particles having a particle size of about 10-30 μm and non-spherical particles having a particle size of less than about 10 μm.**"

In contrast, the high density cobalt-manganese coprecipitated nickel hydroxide spherical particles according to the present invention are **free of non-spherical particles** and have a **mean particle size in the range of 5-20 μm**.

Thus, the claims 1 and 5, and claims depending therefrom, are novel and unobvious and, as such, claims 1 and 5-6, are allowable.

Therefore, the rejection of claims 1 and 5-6 under 35 U.S.C. § 102(b), as being anticipated by Ikoma et al. (U.S. Patent No. 5,700,596) should be withdrawn and claims 1 and 5-6 should be allowed.

Claim 1 is rejected under 35 U.S.C. § 102(e), as being anticipated by Komatsu et al. (U.S. Patent No. 6,132,639), herein after Komatsu et al.

Applicants have amended claims 1 and 5 to define that the high density cobalt-manganese coprecipitated nickel hydroxide spherical particles according to the present invention are **free of non-spherical particles** of the same, and that these particles have a **mean particle size in the range of 5-20 μm**."

Komatsu et al. material **is not** spherical particles of cobalt-manganese coprecipitated nickel hydroxide that are **free of non-spherical particles** of the same, and they **do not** have a **mean particle size in the range of 5-20 μm**."

Therefore, the rejection of claim 1 under 35 U.S.C. § 102(e), as being anticipated by Komatsu et al. should be withdrawn and claim 1 should be allowed.

Claims 1 rejected under 35 U.S.C. § 103(a), as being unpatentable over Ovshinsky et al. (U.S. Patent No. 6,086,843), herein after Ovshinsky et al. in view of Aladjov (U.S. Patent No. 5,788,943), herein after Aladjov.

Ovshinsky et al. describes a two step method for producing a nickel hydroxide material comprising the steps of:

> "combining a nickel ion solution, an ammonium hydroxide solution, and an alkali metal hydroxide solution, whereby a reaction mixture is formed; and

cycling the supersaturation of said reaction mixture by cycling the pH and/or the temperature and/or the pressure of said reaction mixture."

The instantly claimed process is different from that described by Ovshinsky et al. It is a continuous process in which the reactants are continuously added and the product continuously removed without employing pH, temperature and/or pressure cycling. As a result of the difference in the processes, the cobalt-manganese coprecipitated nickel hydroxide spherical particles according to the present invention are:

(1) spherical particles;
(2) free of non-spherical particles;
(3) have a composition represented by the formula:

$$(Ni_{(1-x-y)}Co_xMn_y)(OH)_2$$

wherein $1/10 \leq x \leq 1/3$ and $1/20 \leq y \leq 1/3$;
(4) have a tapping density of 1.5 g/cc or greater; and
(5) have a mean particle size in the range of 5-20 μm.

The particles prepared by the method of Ovshinsky et al. as shown in the only example provided does not have all of the features of the instantly claimed particles.

For example, because the method of Ovshinsky et al. employs pH, temperature

and/or pressure cycling, the particles produced thereby would not be free of non-spherical particles.

Further, such particles would not have a uniform composition, such as the composition of the instantly claimed particles, which have a precise composition represented by the formula:

$$(Ni_{(1-x-y)}Co_xMn_y)(OH)_2$$

wherein $1/10 \leq x \leq 1/3$ and $1/20 \leq y \leq 1/3$.

Still further, while Ovshinsky et al. states that the method can further comprise the step of: "adding metal ions of one or more elements selected from the group consisting of Al, Ba, Bi, Ca, Co, Cr, Cu, Fe, In, K, La, Li, Mg, Mn, Na, Nd, Pb, Pr, Ru, Sb, Sc, Se, Sn, Sr, Te, Ti, Y, and Zn," it does not teach which particular element or elements to add in what particular proportions to produce which particular product and composition.

The list of elements recited includes most of the elements of the most of the groups of the Periodic Table.

The number of possible combinations resulting from selection of 1-28 of the recited elements in any combination, combined with the selection of the various possible amounts of each selection would produce an **infinitely large** number of options that can produce an **infinitely large number of products** having **any formula,**

property, size and shape.

This is of course speculation by Ovshinsky et al. and, as such, is not a teaching or suggestion.

The Office Action states:

"It would have been obvious to one of ordinary skill in the art to modify the composition of Ovshinsky et al. by optionally choosing Co and Mn as modifiers to benefit from reduced swelling and reduced Ni reaction potential, as it would have been customary to do such a modification in the art at the time of disclosure of invention by the applicants as shown by Aladjov (Col-1, Lines: 61-64; Col-2, Lines 17-21; Col-3, Lines 4-16, Col-4, Lines 19-20) in the analogous art, and with the expectation of reasonable success in obviously arriving at the limitations of the instant claim by the applicants."

If the above statement of the Office Action was accurate, one would also expect that Ovshinsky et al. would have used the Co and Mn as modifiers in its own examples to benefit from reduced swelling and reduced Ni reaction potential, "as it would have been customary to do such a modification in the art at the time of disclosure" of its own invention.

However, contrary to expectations resulting from the premise of the Office Action, Ovshinsky et al., for example, **does not use manganese in any of its own Examples**, even though Aladjov had already issued as a patent before the filing of an application for patent by Ovshinsky et al.

In view of this fact, one can only conclude that it would have been **unobvious** to

one of ordinary skill in the art to modify the composition of Ovshinsky et al. by optionally choosing Co and Mn as modifiers to benefit from reduced swelling and reduced Ni reaction potential, as it would have been customary to do such a modification in the art at the time of disclosure of invention by the applicants of Ovshinsky et al. as shown by Aladjov (Col-1, Lines: 61-64; Col-2, Lines 17-21; Col-3, Lines 4-16, Col-4, Lines 19-20) in the analogous art, and with the expectation of reasonable success in obviously arriving at the limitations of the instant claim by the applicants.

In its sole example, Ovshinsky et al. is designed to prepare only nickel cobalt hydroxide electrodes without manganese.

Thus, with this fact alone, Ovshinsky et al. does not provide an endorsement of its own teachings and, as such, a person of ordinary skill in the art would not view such statements as being a teaching or suggestion.

Further, because chemical arts are unpredictable arts, a person of ordinary skill in the art can **only** determine the nature of the products having a particular formula, property, size and physical shape by:

(1) **extensive undue experimentation**, which is **impermissible**, such undue experimentation being the equivalent of searching for a needle in a haystack; or

(2) **impermissible hindsight**, because such a determination relies on the contents of the instantly claimed invention.

Aladjov describes an improved process for producing battery-grade nickel hydroxide wherein the improvement comprises introducing **ultrasonic energy** to alter the **macro and microstructure of the nickel hydroxide**.

In the "Background of the Invention" section, Aladjov mentions that the use of nickel hydroxide itself as electrodes in alkaline batteries has some drawbacks. Aladjov states that these drawbacks can be overcome by methods known in the art.

Thus, in column 1, lines 61-64, Aladjov states:

> "The addition of certain metals, such as cadmium, zinc or manganese, as a solid solution with the nickel hydroxide, has been shown to reduce the formation of the γ-NiOOH and thus the swelling."

Aladjov states that these drawbacks can be overcome by the addition of certain metals, such as cadmium, zinc or manganese, as a solid solution, with the nickel hydroxide. Thus, the known practice in the art merely employs adding certain metals, such as cadmium, zinc or manganese, as a solid solution to an already formed nickel hydroxide electrode to reduce the formation of the γ-NiOOH and thus, the swelling.

Similarly, in column 2, lines 17-21, Aladjov states that additives to the nickel hydroxide, like cobalt is thought to affect the Ni^{+2} to Ni^{+3} reversibility and lower the nickel reaction potential in reaction (1).

This is of course speculation by Aladjov and, as such, is not a teaching or

suggestion. In fact, Aladjov does not use any of the cited metals, including the so-called beneficial metals, in the Examples.

In all of the examples, Aladjov is designed to prepare only nickel hydroxide electrodes.

Thus, with this fact alone, Aladjov does not provide an endorsement of its own teachings and, as such, a person of ordinary skill in the art would not view such statements as being a teaching or suggestion.

Further, the method of Aladjov employs "ultrasonic energy" to prepare nickel hydroxide to alter the **macro and microstructure of the nickel hydroxide**.

Therefore, to the extent that the **macro and microstructure of the nickel hydroxide** is altered, it would be different from the particles according to the instantly claimed invention. Therefore, the particles produced thereby would likely **not be free of non-spherical particles**.

Thus, there is no teaching or suggestion in Aladjov, either alone, or in combination with Ovshinsky et al. how to produce **spherical particles that are free of non-spherical particles.**

Further, Aladjov does teach or suggest a well-defined and precise composition, such as the composition of the instantly claimed particles, which have a precise composition represented by the formula:

$$(Ni_{(1-x-y)}Co_xMn_y)(OH)_2$$

wherein $1/10 \leq x \leq 1/3$ and $1/20 \leq y \leq 1/3$.

As is the case with Ovshinsky et al., there is no teaching or suggestion in Aladjov regarding what amounts should be used. Thus, there is no teaching or suggestion in Aladjov, either alone, or in combination with Ovshinsky et al. to produce a well-defined and precise composition, such as the composition of the instantly claimed particles.

Still further, while Aladjov states that metal additives such as cobalt, zinc, cadmium, manganese, transition metal ions such as copper, bismuth, chromium, gallium, indium, lanthanum, samarium or yttrium, other elements including ytterbium, iron, calcium, barium, strontium, mercury or antimony, and other foreign additive materials can be used in its method, it does not teach which particular element or elements to add in what particular proportions to produce which particular product and composition.

The list of elements recited includes most of the elements of the most of the groups of the Periodic Table and "other foreign additive materials."

Counting "other foreign additive materials" as one, the number of possible combinations resulting from selection of 1-20 of the recited elements in any combination, combined with the selection of the various possible amounts of each selection would produce an **infinitely large number** of options that can produce an

infinitely large number of products having **any formula, property, size and physical shape**.

Thus, there is no teaching or suggestion in Aladjov, either alone, or in combination with Ovshinsky et al., regarding how to produce a specific product having a specific formula, specific property, specific size and a specific shape, such as, for example, a spherical particles free of non-spherical particles, a composition represented by the formula:

$$(Ni_{(1-x-y)}Co_xMn_y)(OH)_2$$

wherein $1/10 \leq x \leq 1/3$ and $1/20 \leq y \leq 1/3$; a product having a tapping density of 1.5 g/cc or greater and a mean particle size in the range of 5-20 μm, as by instant claim 1, as amended.

Because chemical arts are unpredictable arts, a person of ordinary skill in the art can **only** determine the nature of the products having a particular formula, property, size and physical shape by:

(1) **extensive undue experimentation**, which is **impermissible**, such undue experimentation being the equivalent of searching for a needle in a haystack; or

(2) **impermissible hindsight**, because such a determination relies on the contents of the instantly claimed invention.

Thus, a person of ordinary skill in the art can not predict even the existence or viability of a material that is selected from an infinitely large number of possible combinations.

Therefore, the rejection of claims 1 and 5-6 under 35 U.S.C. § 103(a), as being unpatentable over Ovshinsky et al. in view of Aladjov should be withdrawn and claim 1 and 5-6 should be allowed.

Based on the foregoing, Applicants respectfully request reconsideration of the present application and allowance of the pending claims, namely, claims 1 and 5-6.

An early issuance of a Notice of Allowability is earnestly solicited.

Respectfully submitted,

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